

*Subj X*

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### WHAT IS CLAIMED IS:

1. A polycation composition comprising:
  - a) a polysaccharide chain having an amount of saccharide units ranging from 2 to 2000;
  - b) at least one oligoamine directly grafted to said polysaccharide chain per each segment of 5 saccharide units, wherein said oligoamine is selected from the group consisting of a linear, branched and cyclic alkyl amine having at least two amino groups; and
  - c) at least one further grafted group selected from the group consisting of a hydrophobic and an amphiphilic group directly grafted to said polysaccharide chain per each segment of 50 saccharide units, wherein said hydrophobic or amphiphilic group includes an aliphatic chain of at least 4 carbons atoms.
2. A biodegradable polycation complex with a polyanion comprising:
  - a) a polysaccharide chain having an amount of saccharide units ranging from 2 to 2000;
  - b) at least one oligoamine directly grafted to said polysaccharide chain per each segment of 5 saccharide units, wherein said oligoamine is selected from the group consisting of a linear, branched and cyclic alkyl amine having at least two amino groups; and
  - c) at least one further grafted group selected from the group consisting of a hydrophobic and an amphiphilic group directly grafted to said polysaccharide chain per each segment of 50 saccharide units, wherein said hydrophobic or amphiphilic group includes an aliphatic chain of at least 4 carbons atoms; complexed with
  - d) an anionic macromolecule selected from the group consisting of polynucleic acids, proteins and polysaccharides that are anionic.
3. A biodegradable polycation composition according to claim 2, wherein said anionic macromolecule is selected from the group consisting of a plasmid, an open chain polynucleic acid, an oligonucleotide, an antisense, a peptide, a protein, a polysaccharide and combinations thereof.

4. A biodegradable polycation composition according to claim 1, wherein said polysaccharide chain is selected from the group consisting of dextrans, arabinogalactan, pullulan, cellulose, cellobios, inulin, chitosan, alginates and hyaluronic acid.

5. A biodegradable polycation composition according to claim 1, wherein said saccharide units are connected by a bond selected from the group consisting of acetal, hemiacetal, ketal, orthoester, amide, ester, carbonate and carbamate.

6. A biodegradable polycation composition according to claim 1, wherein said polysaccharide is a synthetic polysaccharide formed from the condensation of an aldarc acid and a diaminoalkane.

7. A biodegradable polycation composition according to claim 1, wherein said grafted oligoamine is grafted to said polysaccharide chain by a bond selected from the group consisting of an amine bond, an imine bond, an amide bond and a carbamate bond.

8. A biodegradable polycation composition according to claim 1, wherein said oligoamine has the formula:

$$\text{NH}_2\text{-}[\text{CH}_2]_x\text{-N}\text{-}\text{R}\text{-}\text{CH}_2\text{)}_y\text{-N}\text{-}(\text{R}')\text{-}[\text{CH}_2]_z\text{-}]_n\text{-NH}_2$$

wherein x, y, z are an integer between 0 and 4 and x+y+z+ is between 1 and 4 and n is at least 1 when x+y+z=2 or more, or at least 2 when x+y+z=1 and wherein R and R' groups are H or an aliphatic side group of 1 to 6 carbons.

9. A biodegradable polycation composition according to claim 1, wherein said oligoamine is a peptide of up to 20 amino acids with at least 50% of the amino acid are cationic including lysine, ornithine, and arginine.

10. A biodegradable polycation composition according to claim 1, wherein said oligoamine is selected from the group consisting of spermine and derivatives thereof.

11. A biodegradable polycation composition according to claim 1, wherein said

oligoamine is selected from the group consisting of a linear and branched ethyleneimine oligomer having up to 10 ethylene imine units.

12. A biodegradable polycation composition according to claim 1, having an amphiphilic residue wherein said amphiphilic residue is selected from the group consisting of fatty chains, phospholipids, cholesterol derivatives, ethylene glycol oligomers, propylene glycol oligomers and combinations thereof.

13. A biodegradable polycation composition according to claim 12, wherein said ethylene and propylene glycol oligomers have a fatty chain block on one side.

14. A biodegradable polycation composition according to claim 12, wherein said amphiphilic residue is connected to said polysaccharide chain by a bond selected from the group consisting of an amine, amide, imine, ester, ether, urea, carbamate and carbonate.

15. A biodegradable polycation composition according to claim 12, wherein said amphiphilic residue is an oleic chain.

16. A biodegradable polycation composition according to claim 12, wherein said amphiphilic residue facilitates the crossing of the polycation through biological membranes.

17. A biodegradable polycation composition according to claim 1, wherein said polycation composition is not toxic or immunogenic.

18. A biodegradable polycation composition according to claim 1, wherein said composition further comprises a ligand for facilitating the binding of said composition to a predetermined type of cell or tissue.

19. A biodegradable composition according to claims 1 and 2, in combination with cationic and nonionic lipids or polymers for enhanced cell transfection.

20. A biodegradable composition according to claims 1 and 2, wherein polycation has a structure selected from the group consisting of a comb-like chain, a branched chain and a cross-linked chain.

21. A pharmaceutical composition, comprising the composition of claim 2, in combination with a pharmaceutically acceptable carrier.

22. A pharmaceutical composition of claim 21, in combination with a biodegradable polymer matrix or capsule for controlled, timed and extended delivery of the complex.

23. A polycation composition according to claim 1, wherein used as a scaffold for cell growth.

24. A polycation composition according to claim 1, wherein said composition is used in non-medical coatings in the printing and electronic industry.

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